

## HIGH FREQUENCY (26GHZ)

## INTELLIGENT NONCONTACT

## RADAR LEVEL TRANSMITTER





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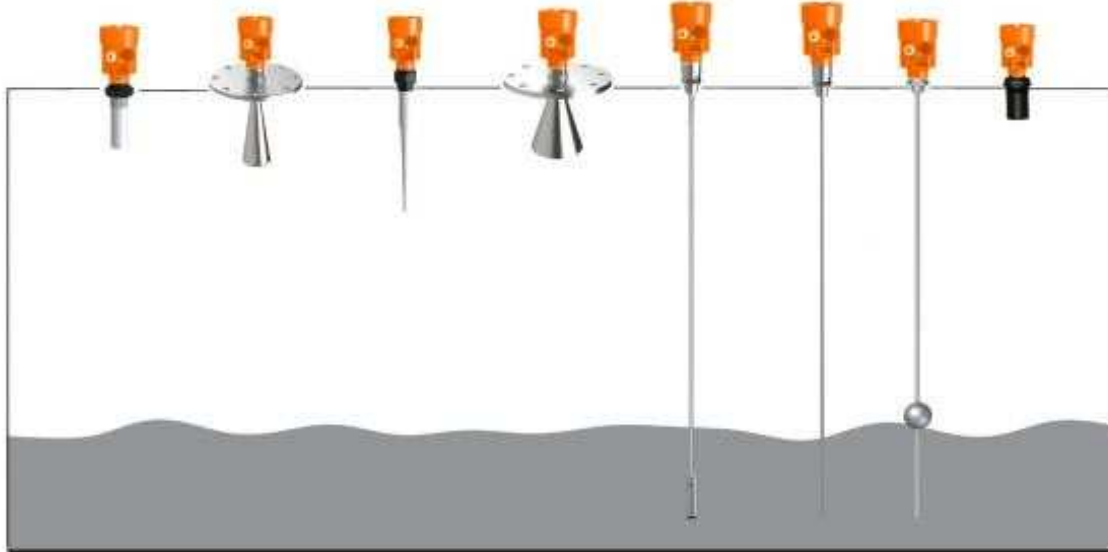
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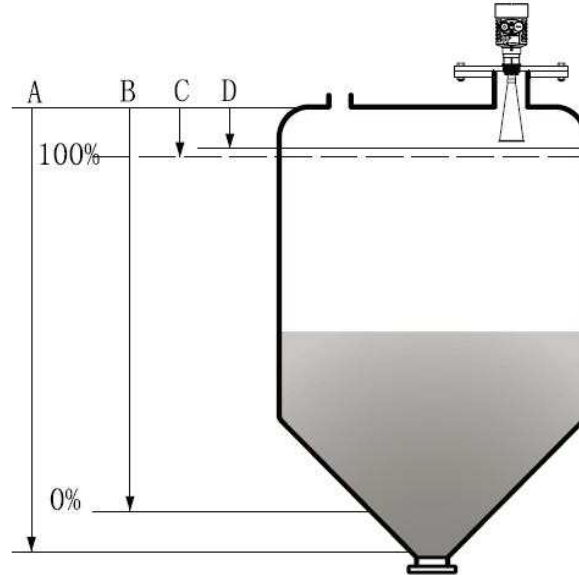
## 1. Product description

TLR90 series transmitters are 26GHz high-frequency radar level transmitters with analog signals 4-20mA, the Max. Measuring distance is up to 70m. The antenna has been further optimized, and the latest update microprocessor can make higher speed signals analysis, which enables the level transmitters can be used in very complicated measuring applications such as reaction kettles or solid bunkers.

## 2. Working principle

The radar level transmitter antenna emits narrower micro wave pulses which are transmitted via the antenna. The micro waves are reflected back after touching the surface of a medium, and then antenna system receives them and transmits them into the electrical circuit where they are automatically turned into the level signals.

- A. Setting measuring range
- B. Low level adjustment
- C. High level adjustment
- D. Dead zone



Measuring reference is the bottom surface of threads or the sealing surface of a flange.

Note: when using the radar level transmitter, must keep the highest level of medium out of the dead zone (see area D shown in the drawing).

## ● Features

The radar level transmitter adapts the emitting frequency of 26GHz, therefore it has the following features:

- Noncontact measuring, no abrasion, no contamination
- Easy installation due to small size of antenna
- Shorter wave length, which can get better reflection for the inclined solid surface.
- Smaller measuring dead zone, which can get better measuring results for small tanks.
- Smaller beam angle, which makes the energy be more concentrated, enhancing the wave reflection ability which can keep signals more powerful to avoid obstacles.
- Almost unaffected by corrosion and foams.

- Almost unaffected by changes of steam, changes of temperature and pressure in the air.
- Even in heavy dust environment, the transmitter can also receive the real level return wave.
- High SNR, which can make the instrument get better performance.
- Frequency 26GHz is the best option for measuring solid and low dielectric constant medium.

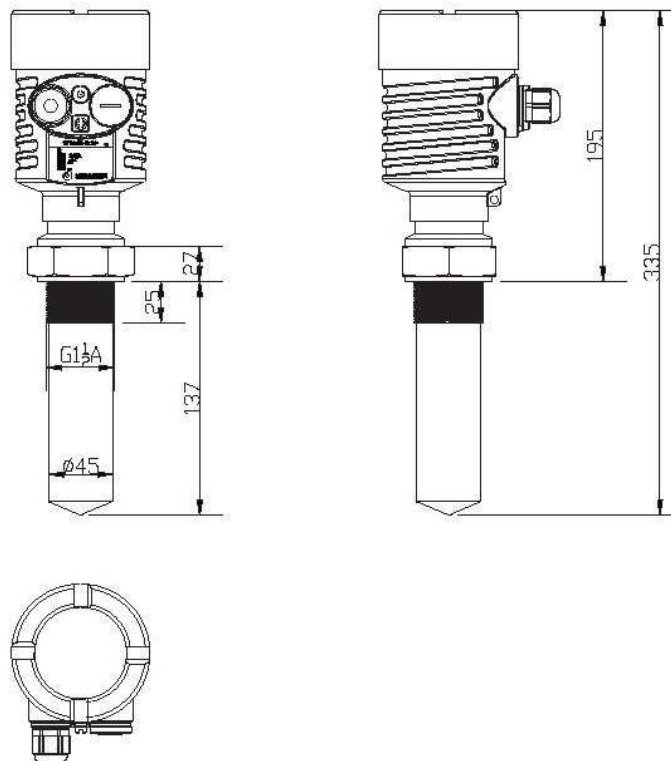
### **3. Instrument introduction : TLR91**

- **Features:** Corrosion resistant and wholly sealed radar antenna, short dead zone and easy installation. It's mainly used for measurement of strong corrosive liquids such as hydrochloric acid, nitric acid, sulfuric acid, alkali liquids, etc, in industries of chemical, metallurgy, refinery, food processing, etc.

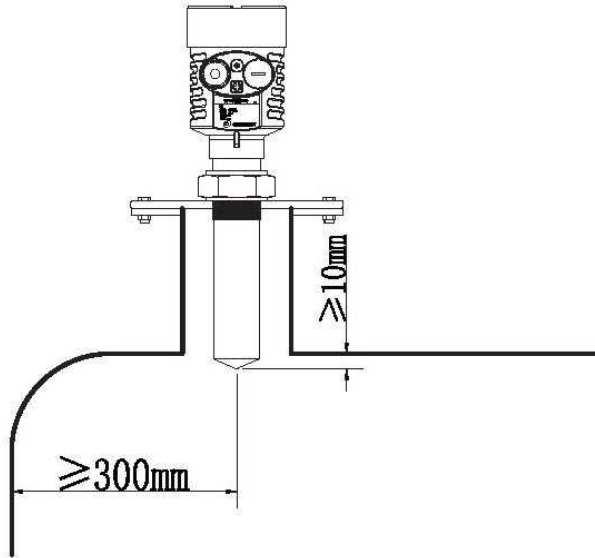


- Measuring range (maximum): 20m (depends on dielectric constant of different medium and the concrete working conditions)
- Process connection: Thread, flange
- Medium temperature: -60°C to +120°C
- Process pressure: -0.1 to +0.3MPa
- Accuracy: ±3mm
- Repeatability: ±1mm
- Frequency range: 26GHz
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67
- Signal output: 4-20mA/ HART (2-wire/ 4-wire) , RS485/ Modbus
- Air purging and liquid rinsing: on request
- For those with communication of RS485/MODBUS, backlight is available on request

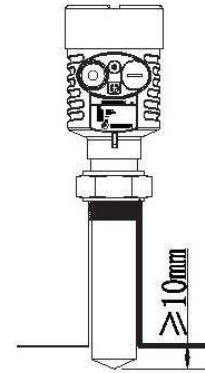
### Dimensions of TLR 91



## Installation of TLR 91



Installation with flange



Installation with thread

The minimum distance between the symmetrical central line of the transmitter and the inner tank wall should be at least 300mm

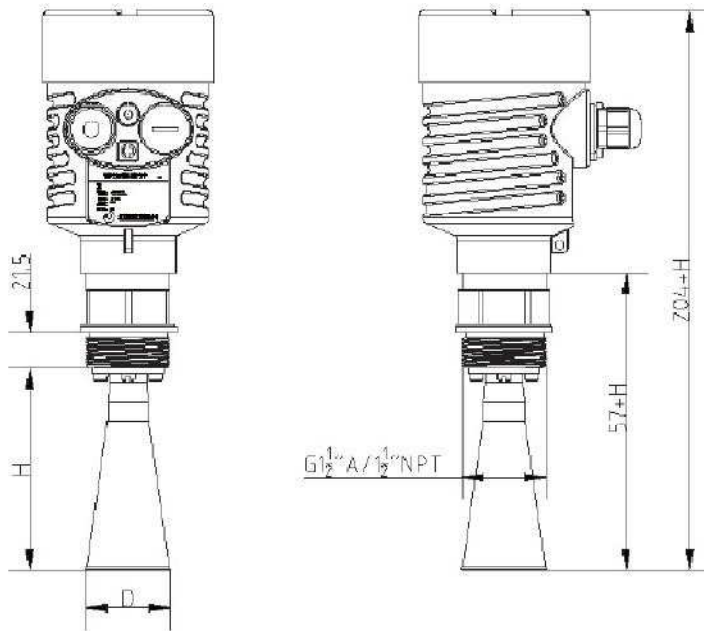
## TLR 92

Features: Horn antenna, small beam angle, strong wave focusing, high accuracy. It's mainly used for measurement of light corrosive liquids with high temperature and pressure in industries of petroleum, chemical, metallurgy and water treatment, etc.



- Measuring range (maximum): 30m (depends on dielectric constant of different medium and the concrete working conditions)
- Process connection: Thread, flange
- Medium temperature: -60 ~ +250°C
- Process pressure: -0.1 ~ +4.0 MPa
- Accuracy: ±2mm
- Repeatability: ±1mm
- Frequency range: 26GHz
- Enclosure protection grade: IP67
- Explosion proof: Ex ia IIC T6 Ga
- Signal output: 4-20mA/ HART (2-wire/ 4-wire), RS485/Modbus
- For those with communication of RS485/MODBUS, backlight is available on request

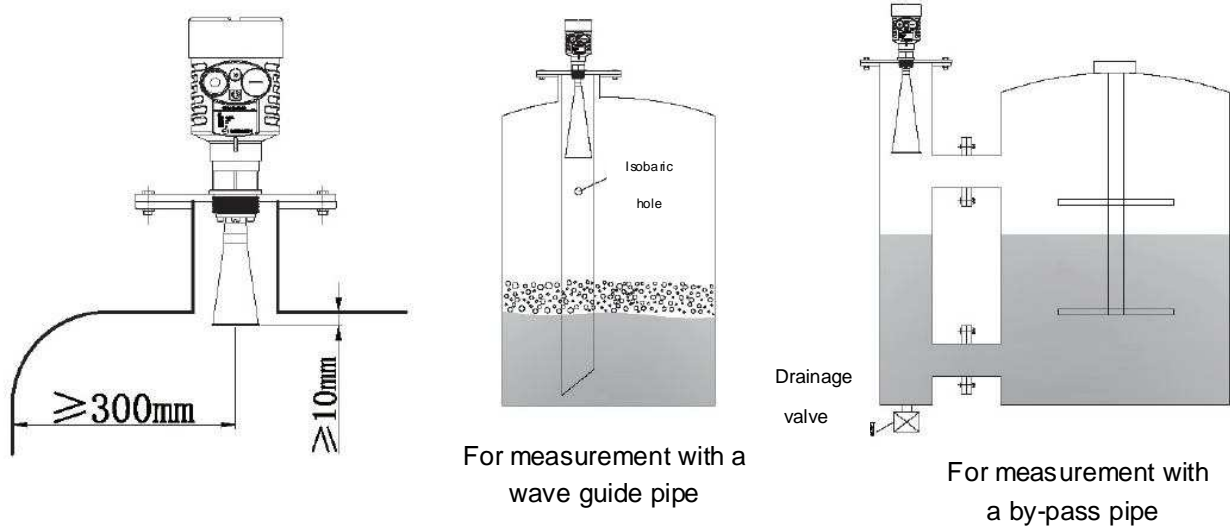
### Dimensions of TLR 92



Horn model selection	
Horn diameter D	Horn height H (mm)
Ø46	140
Ø76	227
Ø96	288
Ø121	620



## Installation of TLR92



The minimum distance between the symmetrical central line of the transmitter and the inner tank wall should be at least 300mm

## TLR 92H

- Features: High accuracy, strong strength of anti-interference, not affected by temperature, humidity, wind force and direction, easy installation and calibration, low power consumption.



- Application: Suitable for water level measurement and monitoring of lakes, reservoirs, rivers, open channels, and tidal level of oceans.
- Measuring range (maximum): 30m
- Process connection material: PP/ SS
- Medium temperature: -40°C~+100°C
- Process pressure: ATM
- Antenna material: SS
- Accuracy: ±3mm
- Frequency range: 26GHz
- Signal output: RS485/ Modbus
- Power supply: 6 to 24V DC
- Display: optional
- Backlight is available on request

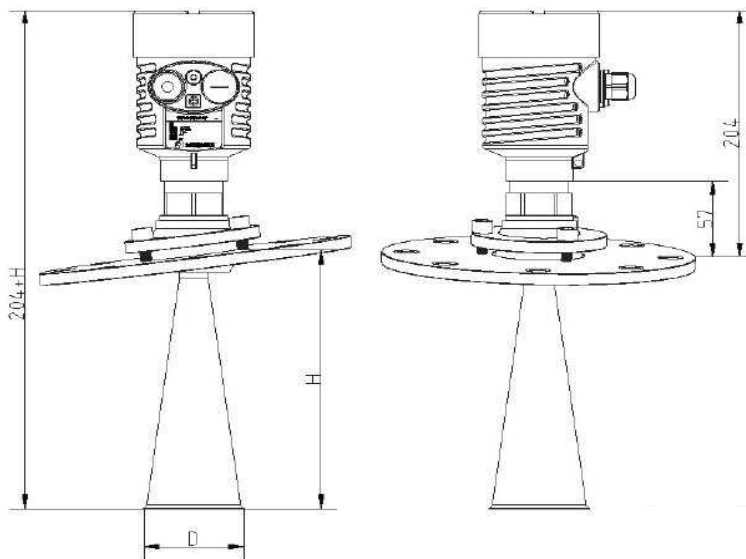
### **TLR 93**

- Application: Solid powder, particles, bulks, with heavy dust, easy crystallization and condensation, etc.



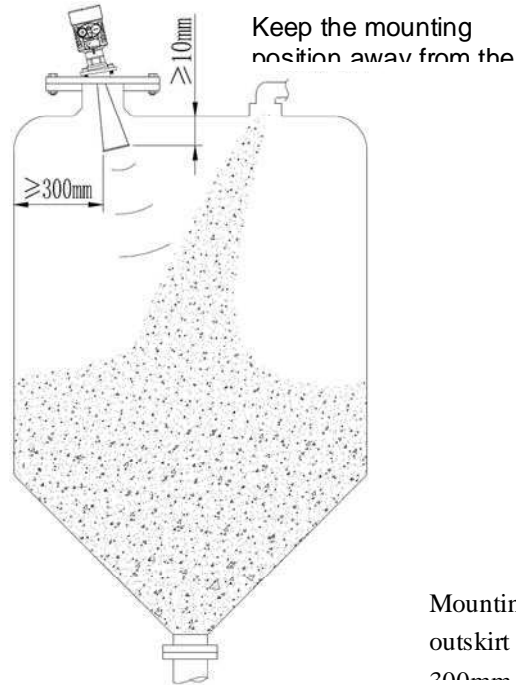
- Measuring range (maximum): 70m (depends on dielectric constant of different medium and the concrete working conditions)
- Process connection: Thread, flange or flange with universal joint, for antenna direction adjustment.
- Medium temperature: -60°C ~+250°C
- Process pressure: ATM, or, -0.1 - +0.3 MPa
- Accuracy: ±15mm
- Repeatability: ±2mm
- Frequency range: 26GHz
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67
- Signal output: 4-20mA/ HART (2-wire/ 4-wire), RS485/Modbus
- With universal joint flange, the antenna can aim at the solid level surface exactly to get more accurate measured value.
- For those with communication of RS485/MODBUS, backlight is available on request

**Dimensions of TLR93**



Horn model selection	
Horn diameter D	Horn height H (mm)
Ø76	227
Ø96	288
Ø121	620

## Installation of TLR 93



Mounting position: keep the outskirts of the antenna at least 300mm away from the inner wall

## TLR 93H

Features: High accuracy, strong strength of anti-interference, not affected by temperature, humidity and wind force and direction, easy installation and calibration, low power consumption.



- Application: Suitable for water level measurement and monitoring of rivers, reservoirs, lakes, open channels, and tidal level of oceans.
- Measuring range (maximum): 70m (depends on dielectric constant of different medium and the concrete working conditions)
- Process connection material: PP/ SS
- Medium temperature: -40°C ~+100°C
- Process pressure: ATM
- Antenna material: SS
- Accuracy: ±10mm
- Frequency range: 26GHz
- Signal output: RS485/ Modbus
- Power supply: 6 to 24V DC
- Display: optional
- Backlight is available on request

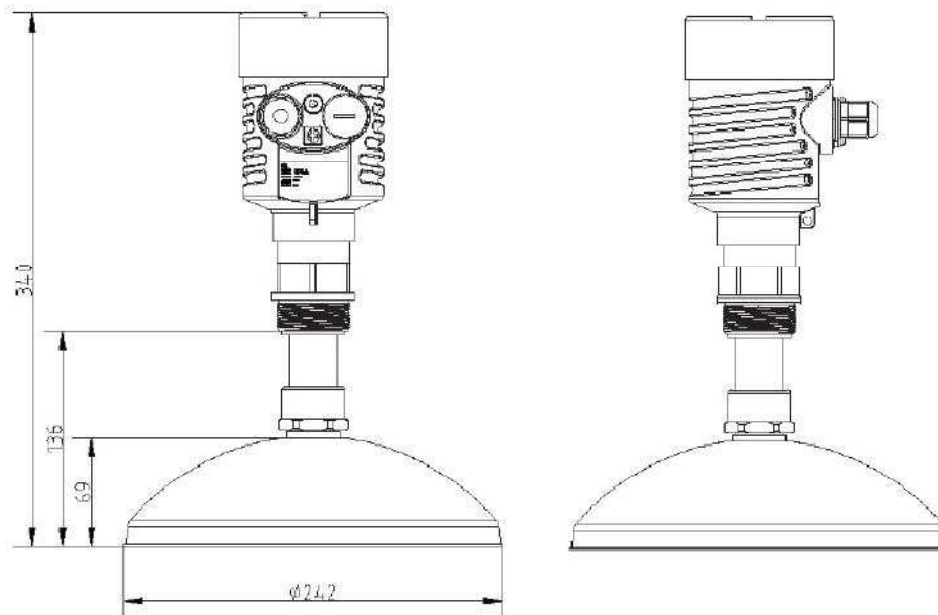
### **TLR 94**

- Application: Solid level for process tanks with heavy dust or ash, easy crystallization and condensation.etc.

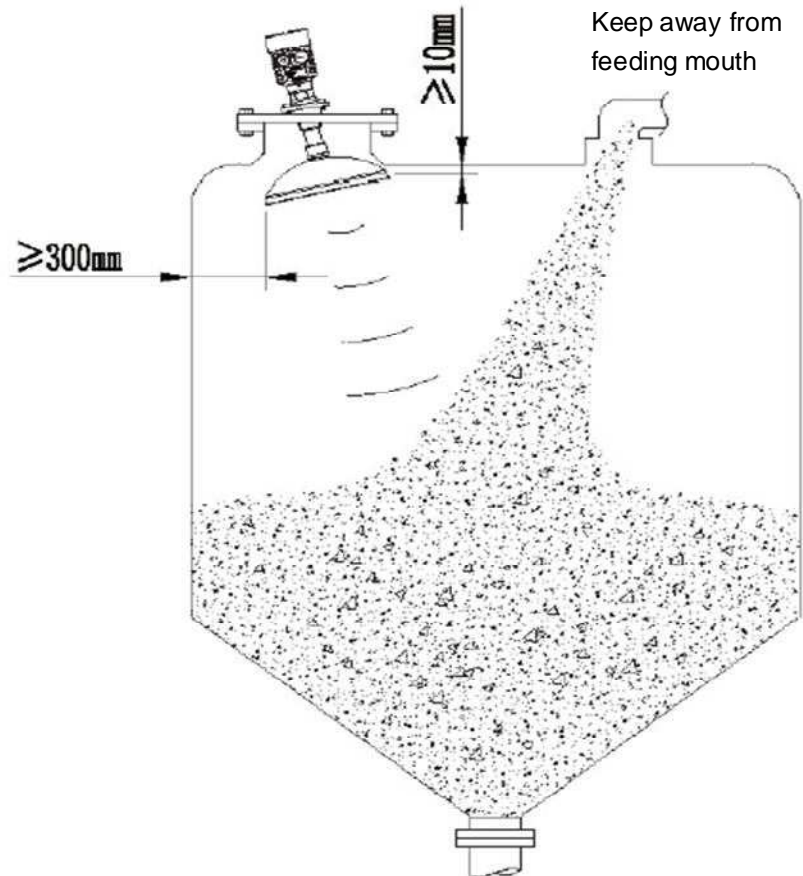


- Measuring range (Maximum): 70m (depends on dielectric constant of different medium and the concrete working conditions)
- Process connection: Thread, flange
- Medium temperature: -60°C ~ +250°C
- Process pressure: ATM, or -0.1 - +0.3MPa
- Accuracy:  $\pm 15\text{mm}$
- Repeatability:  $\pm 2\text{mm}$
- Frequency range: 26GHz
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67
- Signal output: 4-20mA/ HART (2-wire/ 4-wire), RS485/ Modbus
- With universal joint flange, the antenna can aim at the solid level surface exactly to get more accurate measured value
- For those with communication of RS485/MODBUS, backlight is available on request

### Dimension of TLR94



## Installation of TLR 94



The minimum distance between the outskirts of the parabolic antenna and the inner tank wall should be at least 300mm

## TLR 95

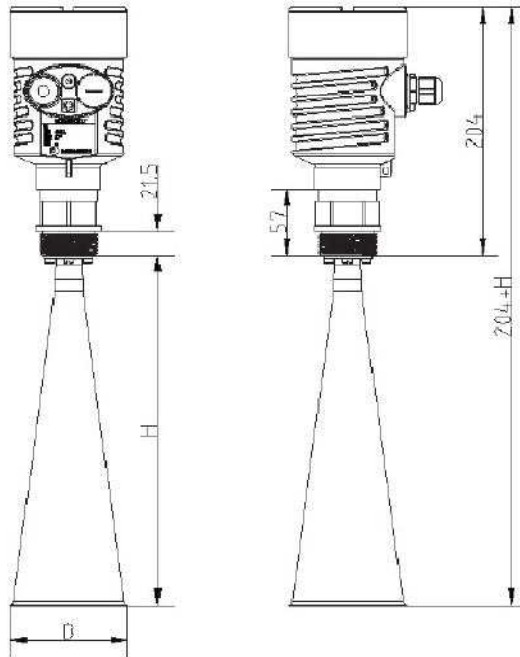
- Application: liquid, solid particles and bulks



- Measuring range (Maximum): 35m (depends on dielectric constant of different medium and the concrete working conditions)
- Process connection: Thread, flange
- Medium temperature: -60°C ~ +250°C
- Process pressure: -0.1 – +4.0 MPa, or ATM
- Accuracy: ±3mm (for liquids); +/-10mm for solids
- Repeatability: ±1mm
- Frequency range: 26GHz
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67
- Signal output: 4-20mA/ HART (2-wire/ 4-wire), RS485/ Modbus
- For those with communication of RS485/MODBUS, backlight is available on request

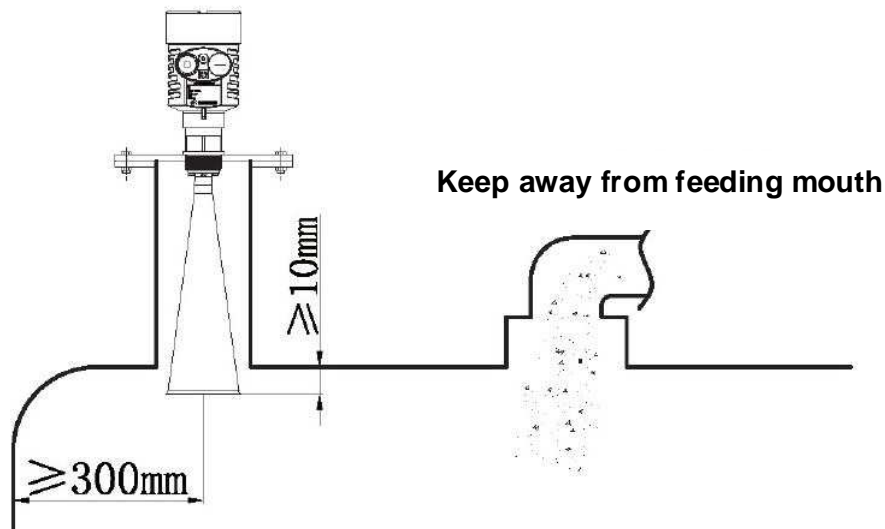


### Dimension of TLR95



Horn model selection	
Horn diameter D	Horn height H (mm)
Ø76	227
Ø96	288
Ø121	620

### Installation of TLR95



The minimum distance between the symmetrical central line of the transmitter and the inner tank wall should be at least 300mm

### **TLR 95 (F)**

- **Feature:** Sealed antenna with anti-corrosion cover
- **Antenna size:** 62mm, corresponding to flange sizes, DN80, DN100;  
96mm, corresponding to flange sizes, DN150, DN200
- **Application:** be suitable for strong acids, alkalis, or other strongly corrosive liquids, or liquids with heavy steam, etc.
- **Measuring range:** 35m
- **Process connection:** Flange
- **Working temperature range:** -60 to +150°C
- **Process pressure:** -0.1 to 1.0MPa
- **Accuracy:** +/-3mm
- **Working frequency:** 26GHz
- **Explosion proof:** Ex ia IICT6 Ga
- **Enclosure protection grade:** IP67
- **Signal output:** 4-20mA/ HART (2-wire/ 4 wire) or RS485/MODBUS
- For those with communication of RS485/MODBUS, backlight is available.

### **TLR 95 (FF)**

- **Feature:** Whole sealed structure
- **Antenna size:** 62mm, corresponding to flange sizes, DN80, DN100; 96mm, corresponding to flange sizes, DN150, DN200
- **Application:** be suitable for strongly corrosive liquids tanks with corrosive environment
- **Measuring range:** 35m
- **Process connection:** Flange
- **Working temperature range:** -60 to +150°C
- **Process pressure:** -0.1 to 1.0MPa
- **Accuracy:** +/-3mm
- **Working frequency:** 26GHz
- **Explosion proof:** Ex ia IICT6 Ga
- **Enclosure protection grade:** IP67
- **Signal output:** 4-20mA/ HART (2-wire/ 4-wire) or RS485/MODBUS



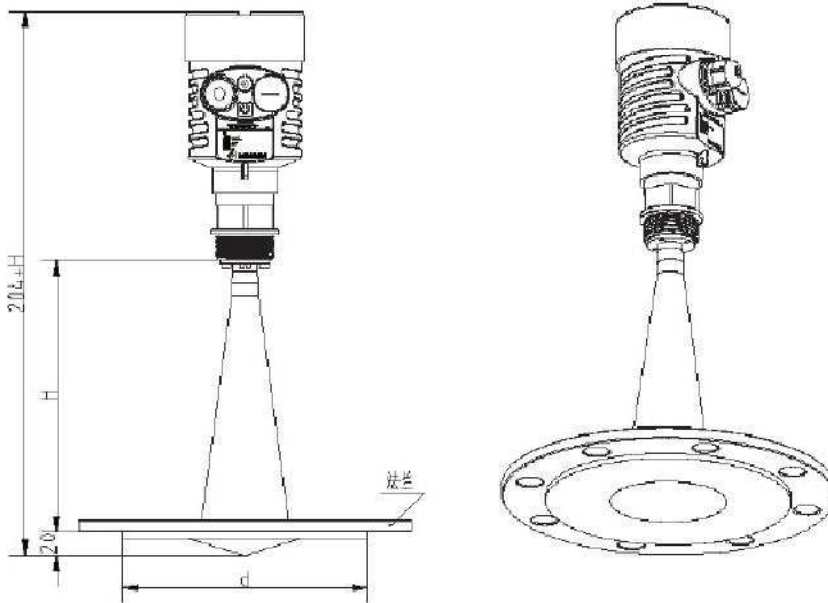
## TLR 96

- Application: sanitary liquid storage containers, heavy corrosive container



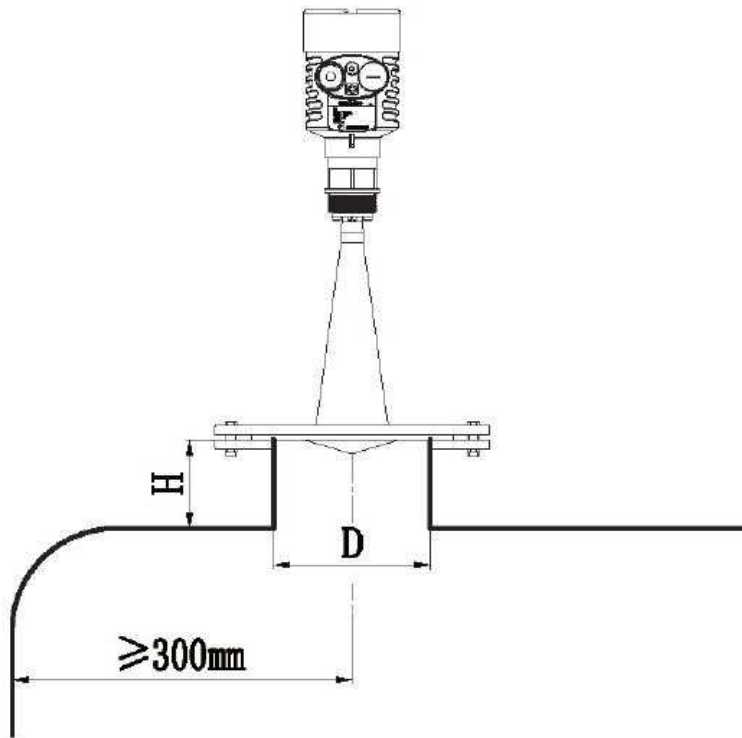
- Measuring range (Maximum): 20m (depends on dielectric constant of different medium and the concrete working conditions)
- Process connection: Flange
- Medium temperature: -60 ~ +150°C
- Process pressure: -0.1 - +0.3MPa, or, ATM
- Accuracy:  $\pm 2$ mm
- Repeatability:  $\pm 1$ mm
- Frequency range: 26GHz
- Explosion proof: Ex ia IIC T6 Ga
- Enclosure protection grade: IP67
- Signal output: 4-20mA/ HART (2-wire/ 4-wire), RS485/ Modbus
- Those with communication of RS485/MODBUS, backlight is available

## Dimension of TLR 96



Horn model selection		
Horn diameter D	Horn height H (mm)	
Ø76	227	Ø99
Ø96	288	Ø132
Ø121	620	Ø156

## Installation of TLR96



D	H
Ø50mm	100mm
Ø80mm	150mm
Ø100mm	200mm

The minimum distance between the symmetrical central line of the transmitter and the inner tank wall should be at least 300mm

#### 4. Installation

- Preparation before installation

Please note the below items to make sure the proper installation of the instrument:

Please leave enough space for the installation.

Please keep the installation position away from where there is strong vibration.

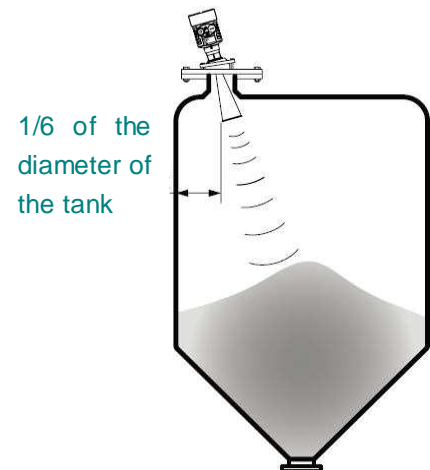
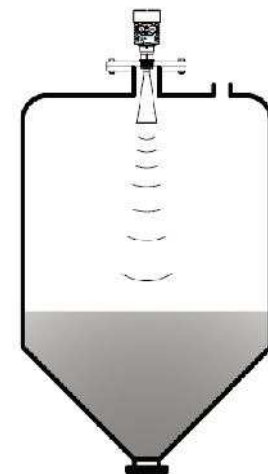
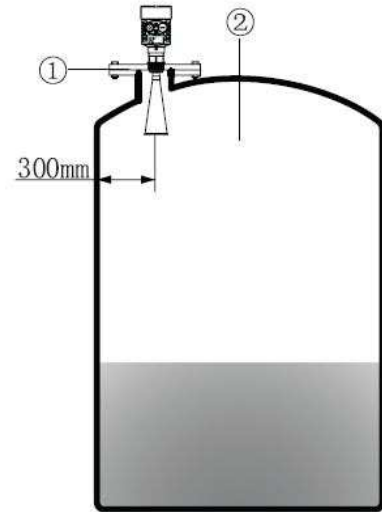
In order to make the fast, easy and safe installation, please follow the installation instructions below!

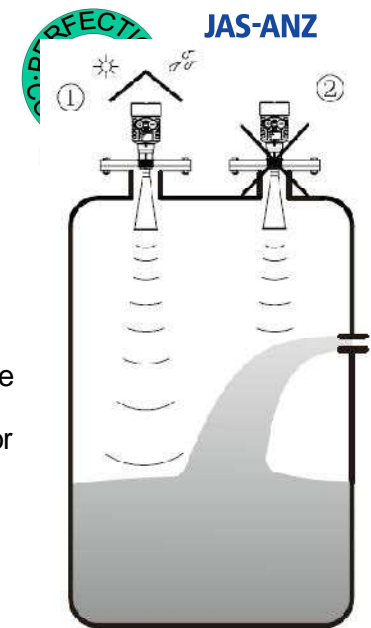
- Installation instruction (refer to the figure upper right): the instrument should be mounted at 1/6 of the tank diameter and the minimum distance between the symmetrical central line of the transmitter and the inner tank wall should be more than 300mm

Note: ①: Reference surface

②: Symmetrical central line of the tank

- Tapered tank: When the top surface of a tank is flat, the instrument can be mounted in the middle of the top, which can ensure the measurement to the bottom of the tank.
- Tank with pile: the antenna should focus on the material surface vertically. When the solid level surface is not flat and horizontal, and repose angle is big, a flange with a universal joint must be used, with which the angle of the antenna can be adjusted and focus on the material surface as much as possible.





- Typical installation error
- Instrument cannot be mounted above feeding inlet. Keep the installation place away from sunshine or rain for the outdoor installation.

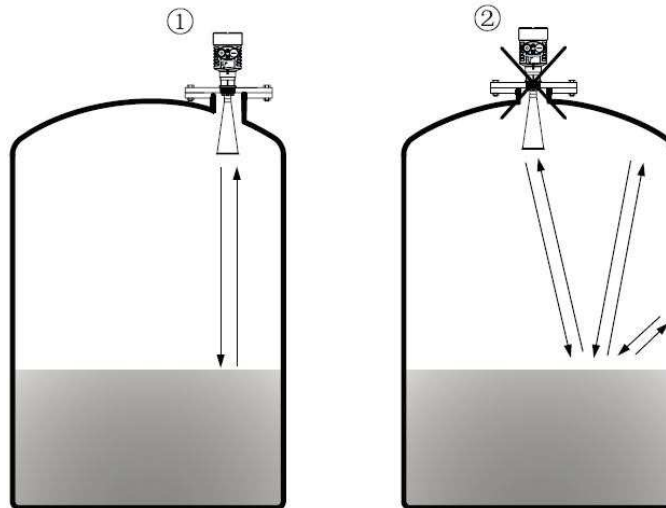
: Correct

: Wrong

- The instrument cannot be mounted at the middle of a tank with arch top. If so, it will have indirect echoes and be affected by multiple echoes. Multiple echoes amplitudes might be stronger than those of the real return signals. The arch top can cause multiple echoes. Therefore, the instrument cannot be mounted at the center of the tank top.

: Correct

: Wrong

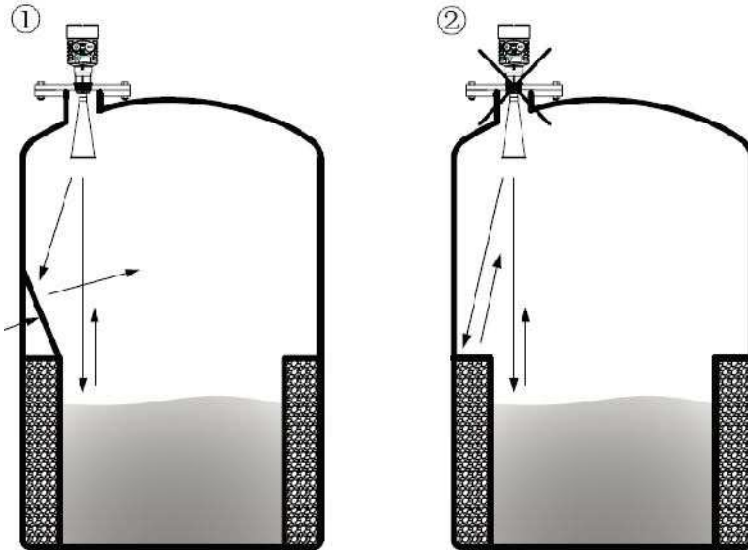


- A reflector is needed when there is an obstacle which may interrupt the measurement in the tank.

: Correct

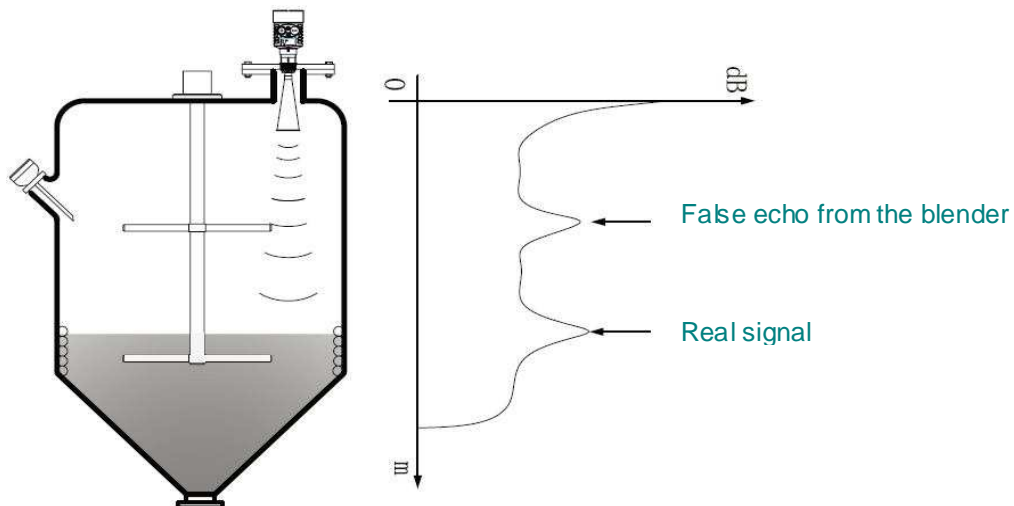
: Wrong

Reflector  
reflects the  
false echoes  
away from the  
obstacle

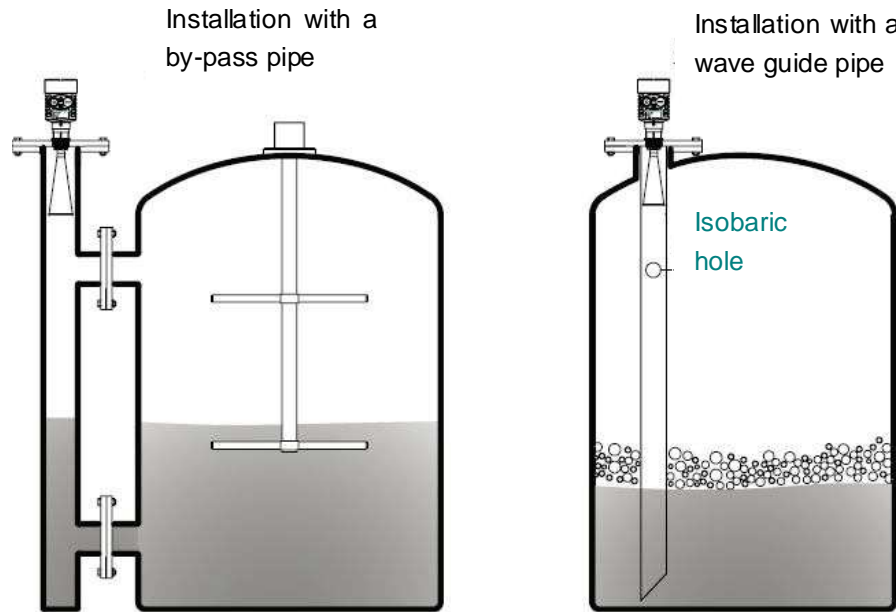


- Measurement with Wave guide pipe

- When there is an obstacle in the area of the signal beam, e.g. a ladder, a limit switch, a heating device, a rack or a blender, etc, it will interrupt the measurement and lead to wrong measuring result. In this case, a wave guide pipe is needed for the measurement.



- Installation by a wave guide pipe ( a wave guide pipe or a bypass pipe) can avoid being affected by any obstacle, foams or liquid waves.



Note:

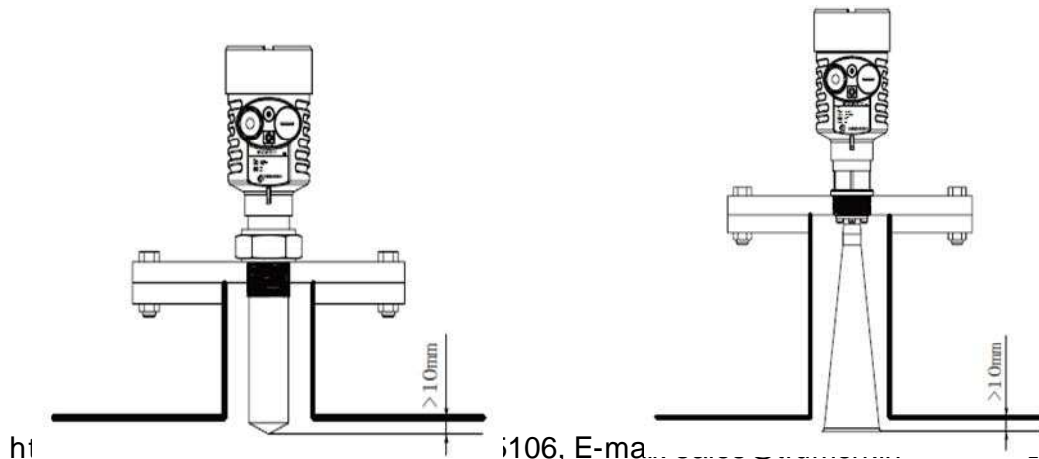
The isobaric hole diameter is (5~10) mm.

Min. diameter of a wave guide pipe is at least 50mm with smooth inner wall.

With a wave guide pipe, instruments can only measure a liquid with good liquidity.

Measurement with a wave guide pipe is not suitable for viscous liquids.

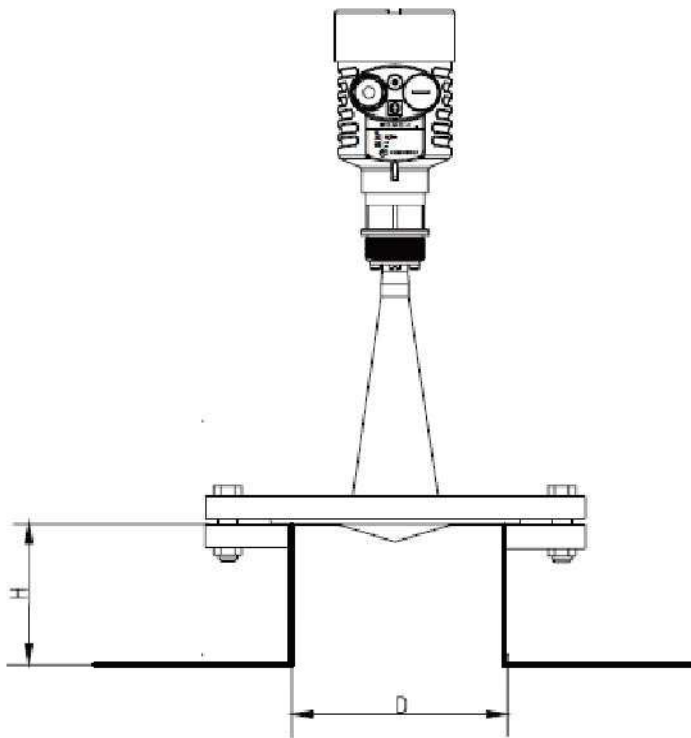
- Height of the extension pipe (or, mounting pipe, or nozzle): the antenna must be extended into the tank at least 10mm. (please refer to the pictures below)



hi

i106, E-ma...





D	H max
50mm	100mm
80mm	150mm
100mm	200mm

## 5. Electric Connection

- **Power supply (4~20) mA/ HART (2-wire)**

Power supply shares one 2-wire cable with the output signal. Regarding to the actual power supply voltage, see the technical data. A safety barrier must be installed between the power supply and the transmitter for the intrinsically safe type.

- **(4~20) mA/ HART (4-wire)**

Power supply and signal current are separate; each has one 2-wire cable. See the technical data for the actual power supply voltage.

- **RS485/Modbus**

Power supply and the Modbus signal wire are separate; each has one 2-wire shielded cable. See the technical data for the actual power supply voltage.

- **Cable**

General introduction

Cable OD: 5 ~ 9mm (M20 x 1.5)

3.5mm ~ 8.7mm (½NPT)

2-wire or 4-wire cables are used for the electric connection. Due to the electromagnetic interference from the motor drive device, power supply wires or remission devices, the transmitter wires need to be the shielded cable.

(4~20) mA/ HART (2-wire)

Normal 2-wire cable can be used for the power supply.

(4~20) mA/ HART (4-wire)

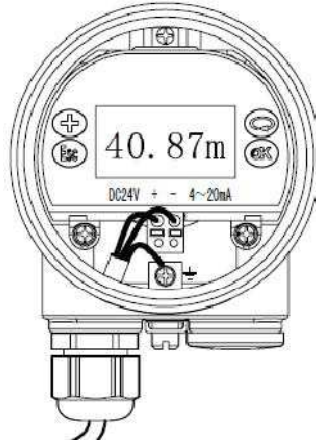
Cables with ground wire for the power supply.

**RS485/ Modbus**

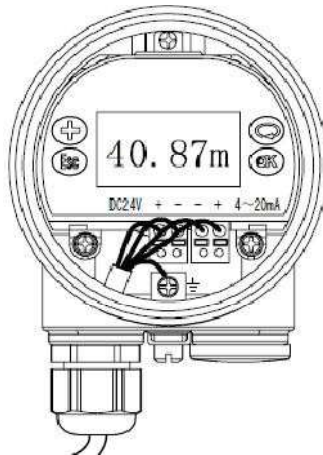
Power supply cables should be shielded cable. Shielded wire and ground wire of the cable Ideally the two ends of shielded wire should be connected the ground. But note that: there will be the grounding compensation current passing through the shielded wire. A grounding electric capacity (e.g. 1µF: 1500V) can be connected to one end (e.g. switch cabinet) when the both ends are connected to the ground. Try to use a resistance with much possible lower value to be connected to the ground. (Note: if the transmitter is used in the Explosion proof area, it is not allowed to connect the both ends to the ground due to the potential output.)

- **Wiring**

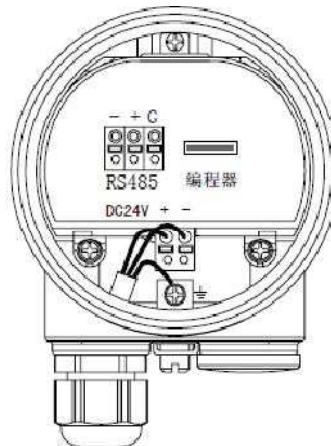
- 24V, 2-wire:



- 24V, 4-wire:



- 24V, RS485/ Modbus:



- **Safety instruction**

All the electric connection must be done under the situation of power being off. Please follow the instructions of the manual.

Please follow the requirements of the local regulation on electrical connection.

Please follow the local regulations on human health and safety. All the electrical operation must be done by the qualified professional technicians.

Please check the nameplate of a transmitter to ensure it can meet your technical requirements. Please make sure the power supply is in accordance with the value printed on the name plate.

- **Enclosure protection grade**

This instrument is in fully conformity with the requirements of the enclosure protection grade IP67. Please make sure the waterproof performance of the cable entry seal. See the picture on the right:

How to make sure the installation can meet the requirements of IP67:

Please make sure the cable entry seal is not damaged.

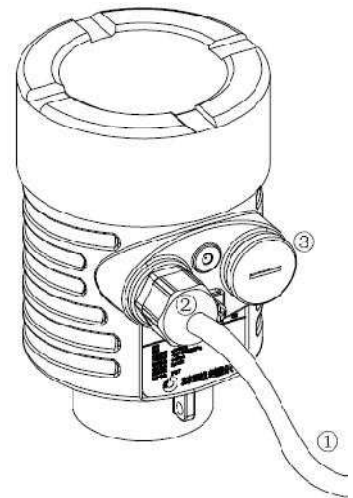
Please make sure the cable is not damaged.

Please make sure the cable meets the requirements of the electrical connection regulations.

Bend the cable down before entering the electrical inlet, which will keep the water away from the housing, see mark ① at the above picture.

Please tighten the cable entry seal, see mark ② at the above picture.

Please tighten the unused cable entry with a seal cap. See mark ③ at the above picture.



## 6. Transmitter calibration

### • Methods of debugging

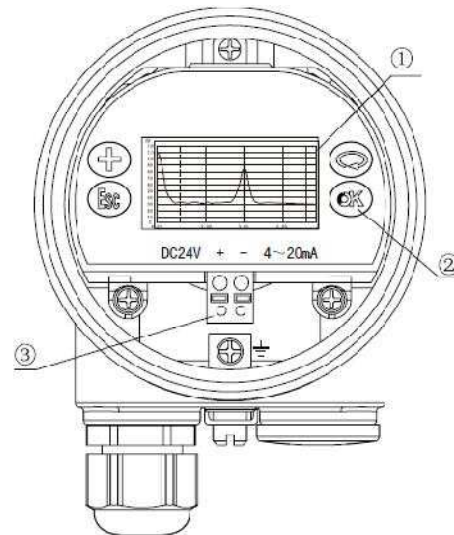
There are three debugging methods for TLR90:

- ①: With display/ buttons
- ②: With a PC with a software
- ③: With a HART hand-hold communicator

- **Display/ button:** Debugging can be done with the 4 buttons on the display screen. Menu language is optional. After debugging, the display keeps the normal working condition. The measured values can be clearly read through the glass screen.

#### Display/button

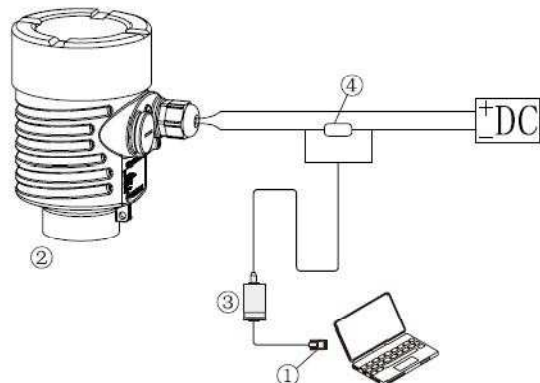
- ① : LCD display
- ② : Buttons
- ③ : Wiring terminal



### • Debugging with a PC with a software

Connect a PC with a HART modem

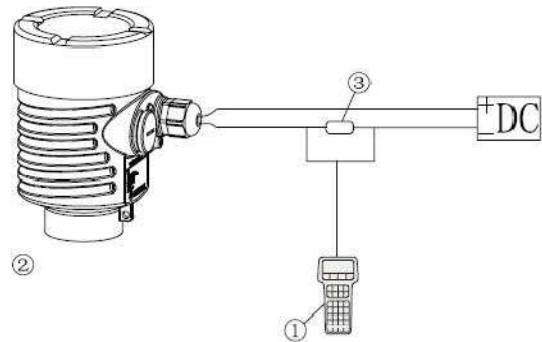
- ① : RS232 interface or USD interface
- ② : TLR9X
- ③ : HART adapter
- ④ : A resistance of 250Ω



**HART hand-hold communicator**

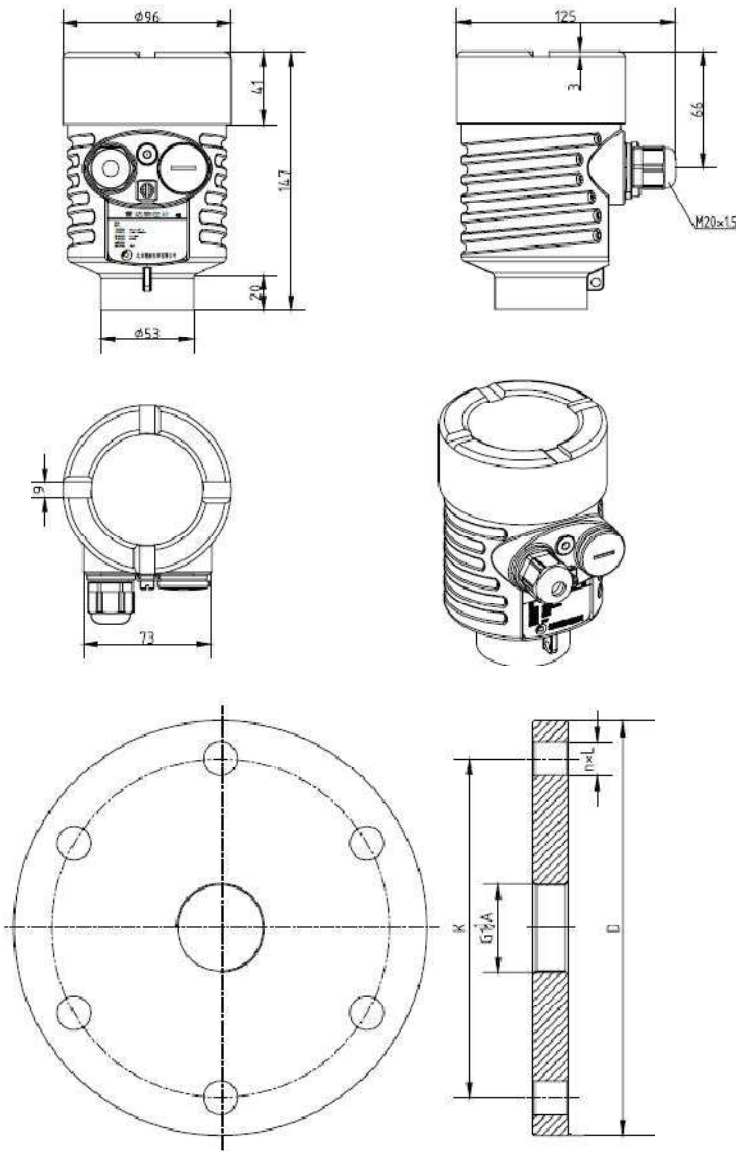
TLR 9X Radars can be calibrated with a HART hand-hold communicator.

- ① : A HART hand-hold communicator
- ② TLR9X
- ③ A resistance of 250 Ω



**7. Structure dimensions (unit: mm)**

Housing



## Flange selection table

Flange Model (GB/T9119-2000)					
No.	Size	OD	Hole Center Distance K	Holes Quantity N	Hole Diameter L
1	DN50	Ø165	Ø125	4	18
2	DN80	Ø200	Ø160	8	18
3	DN100	Ø220	Ø180	8	18
4	DN150	Ø285	Ø240	8	22
5	DN200	Ø340	Ø295	12	22
6	DN250	Ø405	Ø355	12	26

## 8. Technical data

- General data

Model	TLR91	TLR92	TLR93	TLR94	TLR95	TLR96
Process Connection	Thread G1½" A	Thread G1½" A	Thread G1½" A	Thread G1½" A	Thread G1½" A	Thread G1½" A
	Thread 1½" NPT	Thread 1½" NPT	Thread 1½" NPT	Thread 1½" NPT	Thread 1½" NPT	Thread 1½" NPT
	Flange	Flange	Flange	Flange	Flange	Flange
Antenna Material	PVDF	Stainless/ PVDF	Stainless/ PVDF	Stainless/ PVDF	Stainless/ PVDF	Stainless/ PVDF

### Housing

Seal material between housing and cover: silicon rubber

Display window material: PC

Ground connection terminal material: Stainless steel

### Weight:

- TLR 91 1kg (depends on the process connection)

- TLR 92 2kg (depends on the process connection)

- TLR 93 6kg (depends on the process connection)

- TLR 94 7kg (depends on the process connection)

- TLR 95 2kg (depends on the process connection)

- TLR 96 3kg (depends on the process connection)

### Power supply:

2-wire Standard type: (16~26) V DC

Intrinsically safe: (21.6~26.4) V DC

Power consumption: max 22.5mA/ 1W



Allowed ripple: <100Hz Uss<1V (100~100K)Hz Uss<10Mv

### **Cable parameter**

Cable inlet/ plug: 1 M20x1.5 cable entry (cable diameter 5~9mm), one blindness block,

M20x1.5 Wiring terminal: cross section 2.5mm<sup>2</sup>

### **Output parameter**

Output signal/ communication protocol: (4~20) mA/ HART, RS485/ Modbus

Resolution: 1.6μA Error signal: output current no change, 20.5mA, or 22mA, or 3.9mA

2-wire, load resistance, see the drawing below:

Integral time: (0~50) s, adjustable

### **Features:**

Dead zone: the remote end of an antenna

Max. measuring range: **TLR91** 20m (liquids)

**TLR92** 30m (liquids)

**TLR93** 70m (solids)

**TLR94** 70m (solids)

**TLR95** 35m (liquids or solids)

**TLR96** 20m (liquids)

Note: the actual maximum measuring range finally depends on the dielectric constant and concrete working conditions. Micro-wave frequency: 26GHz

Communication connection: HART communication protocol/

Modbus communication protocol;

Measuring interval: approx. 1 second (depends on the parameter setting)

Adjustable time: approx. 1 second (depends on the parameter setting)

Display resolution: 1mm

Ambient temperature: (-40~+70)°C

Process temperature (temperature of antenna):

TLR91	(-60°C ~+120°C)
TLR92	(-60°C ~+250°C)
TLR93	(-60°C ~+250°C)
TLR94	(-60°C ~+250°C)
TLR95	(-60°C ~+250°C)
TLR96	(-60°C ~+150°C)

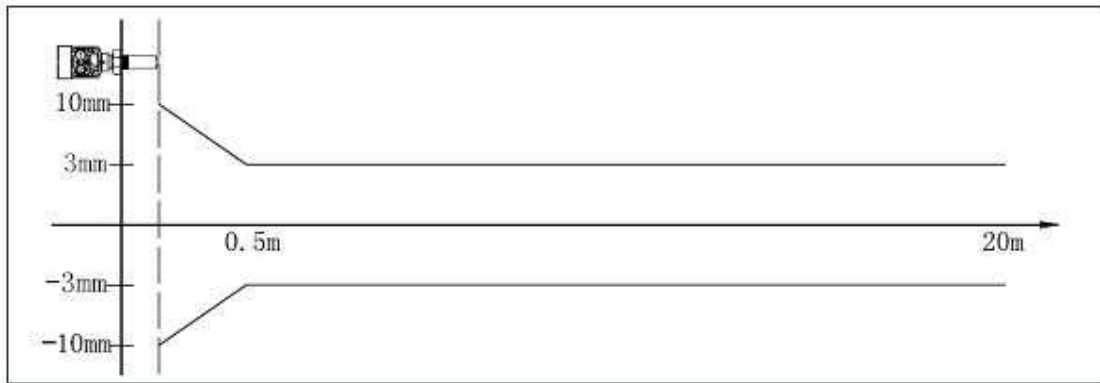
Relative humidity: <95%

Pressure: Max. 4Mpa

Resistance to vibration: mechanic vibration 10m/s<sup>2</sup>, (10-150) Hz

### 9. Transmitter linearity

TLR 91: Beam angle 20°

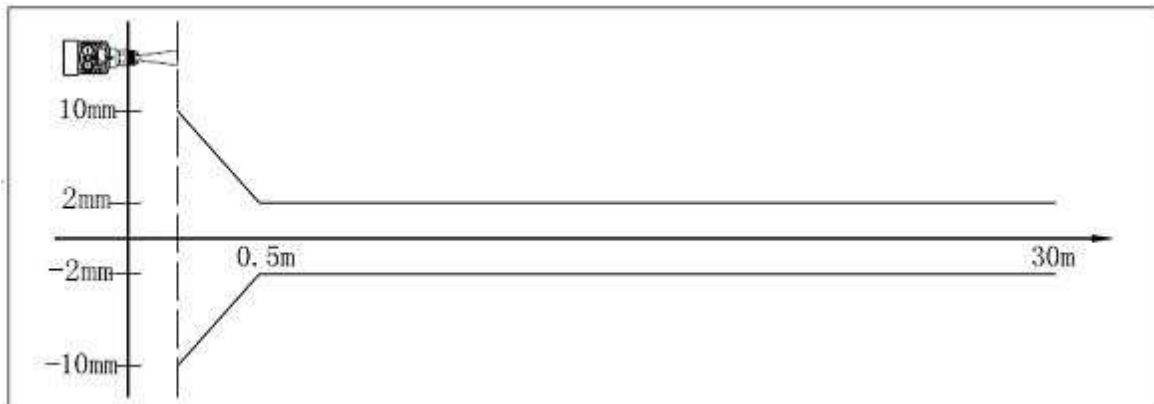


## TLR 92

Beam angle depends on the antenna dimension

Antenna Size (mm)	Beam angle
Φ 46	18°
Φ 76	12°
Φ 96	8°
Φ 121	6°

For the accuracy, please refer to the graph below:

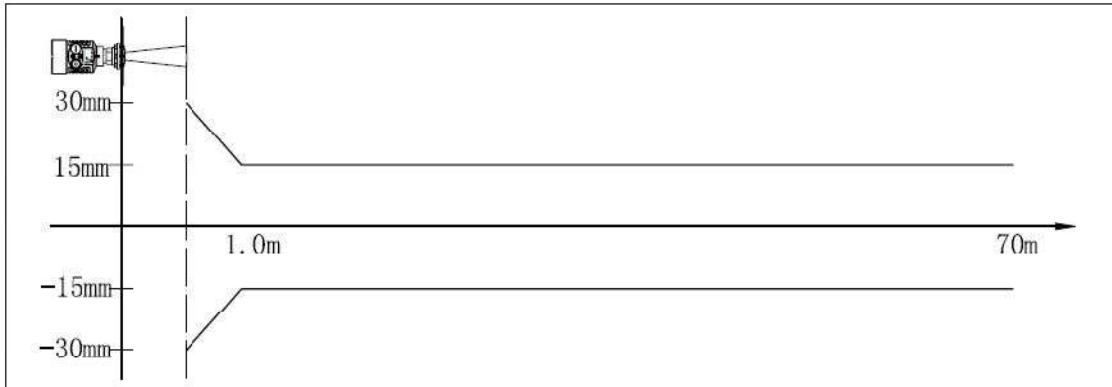


## TLR93

Beam angle depends on size of antenna

Antenna Size (mm)	Beam angle
Φ 46	18°
Φ 76	12°
Φ 96	8°
Φ 121	6°

For the accuracy, please refer to the graph below

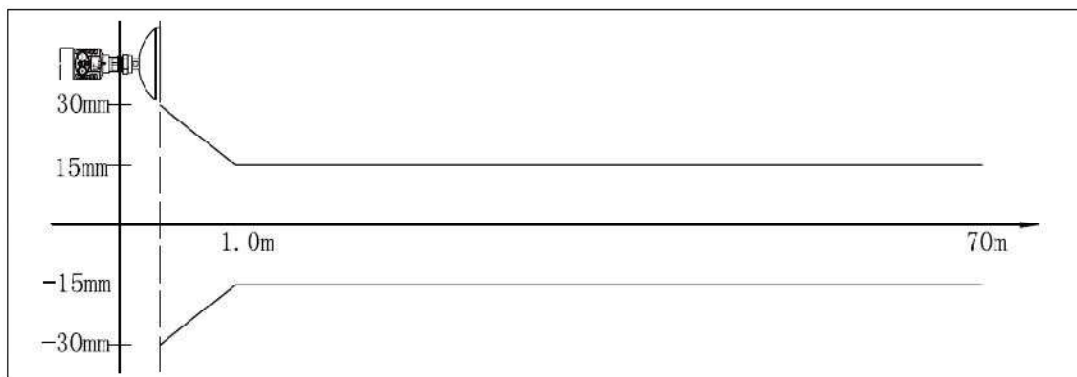


### TLR 94

Beam angle depends on size of antenna

Antenna Size (mm)	Beam angle
Φ 196	5°
Φ 242	4°

For the accuracy, please refer to the graph below:

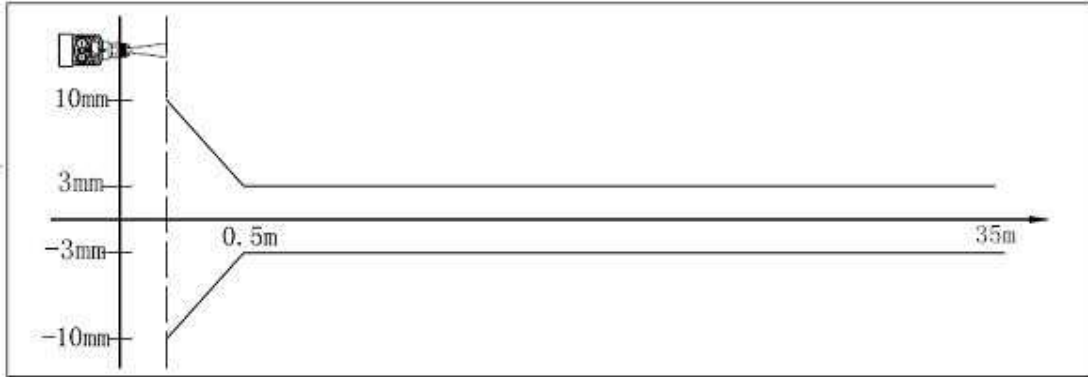


### TLR95

Beam angle depends on size of antenna

Antenna Size (mm)	Beam angle
Φ 76	12°
Φ 96	8°
Φ 121	6°

For accuracy, please refer to the graph below

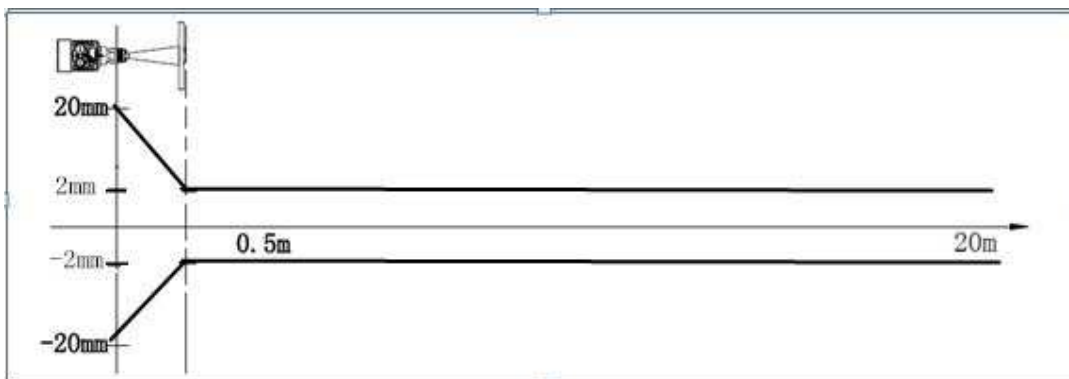


### TLR96

Beam angle depends on size of antenna

Antenna Size (mm)	Beam angle
Φ46	18°
Φ76	12°
Φ96	8°

For the accuracy, please refer to the graph below



## Model selection

### TLR91

Code	Approvals				
P	Standard type (Non-explosion)				
I	Intrinsically safe (Ex ia IIC T6 Ga )				
D	Intrinsically and explosion proof type (Ex d IIC T6 Gb)				
Code	Antenna type/ Material/ Process temperature				
F	PVDF/ (- 60 ~ +120)°C				
Code	Process connection/ Material				
GP	Thread G1½" A/ PVDF				
Code	Flange matching/ Material				
	Material Code	PP (Face flange)	PTFE (Face flange)	304 SS (Face flange)	316L SS (Face flange)
DN40 PN16 flange		AP	AF	AA	AB
DN50 PN16 flange		BP	BF	BA	BB
DN65 PN16 flange		CP	CF	CA	CB
DN80 PN16 flange		DP	DF	DA	DB
DN100 PN16 flange		EP	EF	EA	EB
DN125 PN16 flange		FP	FF	FA	FB
DN150 PN16 flange		GP	GF	GA	GB
DN200 PN16 flange		HP	HF	HA	HB
DN250 PN16 flange		JP	JF	JA	JB
ANSI 1.5" 150lb flange		APM	AFM	AAM	ABM
ANSI 2" 150lb flange		BPM	BFM	BAM	BBM
ANSI 2.5" 150lb flange		CPM	CFM	CAM	CBM



ANSI 3" 150lb flange	DPM	DFM	DAM	DBM
ANSI 4" 150lb flange	EPM	EFM	EAM	EBM
ANSI 5" 150lb flange	FPM	FFM	FAM	FBM
ANSI 6" 150lb flange	GPM	GFM	GAM	GBM
ANSI 8" 150lb flange	HPM	HFM	HAM	HBM
ANSI 10" 150lb flange	JPM	JFM	JAM	JBM
X None				
Y Special design				
<b>Code</b>	<b>Antenna length</b>			
A	138mm			
<b>Code</b>	<b>Electronic unit</b>			
2	(4~20)mA/ 24V DC 2-wire			
3	(4~20)mA/ 24V DC 4-wire			
4	(4~20)mA/ 220V AC 4-wire			
5	(4~20)mA/ 24V DC/ HART, 2-wire			
6	(4~20)mA/ 24V DC/ HART, 4-wire			
7	(4~20)mA/ 220V AC/ HART, 4-wire			
8	RS485/ Modbus			
Y	Special design			
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>			
L	Aluminum/ IP67			
G	Stainless steel 304/ IP67			
<b>Code</b>	<b>Cable entry</b>			
M	M20x1.5			
N	½" NPT			
<b>Code</b>	<b>Display/ Programmer</b>			
V	With			
X	Without			

**TLR 92**

Code	Approvals				
P	Standard type (Non-explosion)				
I	Intrinsically safe (Ex ia IIC T6 Ga )				
D	Intrinsically and explosion proof type (Ex d IIC T6 Gb)				
E	Certificate for ship building (CCS)				
Code	Process connection/ Material				
GA	Thread G1½" A/ 304 stainless steel				
GB	Thread G1½" A/ 316L stainless steel				
NA	NPT thread 1½" / 304 stainless steel				
NB	NPT thread 1½" / 316L stainless steel				
Code	Flange matching/ Material				
Flange size	Material Code	PP (Face flange)	PTFE (Face flange)	304 SS (Face flange)	316L SS (Face flange)
DN40 PN16 flange		AP	AF	AA	AB
DN50 PN16 flange		BP	BF	BA	BB
DN65 PN16 flange		CP	CF	CA	CB
DN80 PN16 flange		DP	DF	DA	DB
DN100 PN16 flange		EP	EF	EA	EB
DN125 PN16 flange		FP	FF	FA	FB
DN150 PN16 flange		GP	GF	GA	GB
DN200 PN16 flange		HP	HF	HA	HB
DN250 PN16 flange		JP	JF	JA	JB
ANSI 1.5" 150lb flange		APM	AFM	AAM	ABM
ANSI 2" 150lb flange		BPM	BFM	BAM	BBM
ANSI 2.5" 150lb flange		CPM	CFM	CAM	CBM






ANSI 3" 150lb flange	DPM	DFM	DAM	DBM
ANSI 4" 150lb flange	EPM	EFM	EAM	EBM
ANSI 5" 150lb flange	FPM	FFM	FAM	FBM
ANSI 6" 150lb flange	GPM	GFM	GAM	GBM
ANSI 8" 150lb flange	HPM	HFM	HAM	HBM
ANSI 10" 150lb flange	JPM	JFM	JAM	JBM
X	None			
Y	Special design			
<b>Code</b>	<b>Antenna type/Material</b>			
	<b>Material</b>			
		Stainless steel	Stainless steel	
		304	316L	
<b>Flange size</b>				
	Horn antenna $\Phi$ 36mm	AA	AB	
	Horn antenna $\Phi$ 46mm	BA	BB	
	Horn antenna $\Phi$ 62mm	CA	CB	
	Horn antenna $\Phi$ 76mm	DA	DB	
	Horn antenna $\Phi$ 96mm	EA	EB	
	Horn antenna $\Phi$ 121mm	FA	FB	
Y	Special design			
<b>Code</b>	<b>Anticorrosive function</b>			
A	With			
B	Without			
<b>Code</b>	<b>High temperature adaptor/ Process temperature</b>			
P	Without/ (-60~150) $^{\circ}$ C			
G	With/ (-60~250) $^{\circ}$ C			
<b>Code</b>	<b>Electronic unit</b>			

<b>2</b>	(4~20)mA/ 24V DC 2-wire
<b>3</b>	(4~20)mA/ 24V DC 4-wire
<b>4</b>	(4~20)mA/ 220V AC 4-wire
<b>5</b>	(4~20)mA/ 24V DC/ HART, 2-wire
<b>6</b>	(4~20)mA/ 24V DC/ HART, 4-wire
<b>7</b>	(4~20)mA/ 220V AC/ HART, 4-wire
<b>8</b>	RS485/ Modbus
<b>Y</b>	Special design
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>
<b>L</b>	Aluminum/ IP 67
<b>G</b>	Stainless steel 304/ IP 67
<b>Code</b>	<b>Cable entry</b>
<b>M</b>	M20x1.5
<b>N</b>	½" NPT
<b>Code</b>	<b>Programmer/ Display</b>
<b>V</b>	With
<b>X</b>	Without
<b>Code</b>	For water level monitoring
<b>H</b>	Water in lake, river channel, reservoir, open channel, tidal level

## TLR93

Code	Approvals			
P	Standard type (Non-explosion)			
I	Intrinsically safe (Ex ia IIC T6 Ga )			
D	Intrinsically and explosion proof type (Ex d IIC T6 Gb)			
Code	Process connection/ Material			
GA	Thread G1½" A/ 304 stainless steel			
GB	Thread G1½" A/ 316L stainless steel			
NA	NPT thread 1½" / 304 stainless steel			
NB	NPT thread 1½" / 316L stainless steel			
Code	Flange matching/ Material			
Flange size	Material Code	304 SS (Face flange)	316L SS (Face flange)	304 SS (Universal flange)
DN40 PN16 flange		AA	AB	—
DN50 PN16 flange		BA	BB	—
DN65 PN16 flange		CA	CB	—
DN80 PN16 flange		DA	DB	DW
DN100 PN16 flange		EA	EB	EW
DN125 PN16 flange		FA	FB	FW
DN150 PN16 flange		GA	GB	GW
DN200 PN16 flange		HA	HB	HW
DN250 PN16 flange		JA	JB	JW
ANSI 1.5" 150lb flange		AAM	ABM	—
ANSI 2" 150lb flange		BAM	BBM	—
ANSI 2.5" 150lb flange		CAM	CBM	—
ANSI 3" 150lb flange		DAM	DBM	DWM

ANSI 4" 150lb flange	EAM	EBM	EWM
ANSI 5" 150lb flange	FAM	FBM	FWM
ANSI 6" 150lb flange	GAM	GBM	GWM
ANSI 8" 150lb flange	HAM	HBM	HWM
ANSI 10" 150lb flange	JAM	JBM	JWM
X	None		
Y	Special design		
<b>Code</b>	<b>Air purging</b>		
A	With		
B	Without		
<b>Code</b>	<b>Antenna type/ Material</b>		
<b>Flange size</b>	<b>Material</b>	Stainless steel 304	Stainless steel 316L
	<b>Code</b>		
	Horn antenna $\Phi$ 36mm	AA	AB
	Horn antenna $\Phi$ 46mm	BA	BB
	Horn antenna $\Phi$ 62mm	CA	CB
	Horn antenna $\Phi$ 76mm	DA	DB
	Horn antenna $\Phi$ 96mm	EA	EB
	Horn antenna $\Phi$ 121mm	FA	FB
Y	Special design		
<b>Code</b>	<b>Dust proof</b>		
A	With		
B	Without		
<b>Code</b>	<b>Radiation fins/ Process temperature</b>		
P	Without/ (-60 ~ +150) $^{\circ}$ C		
G	With/ (-60 ~ +250) $^{\circ}$ C		

<b>Code</b>	<b>Electronic unit</b>
2	(4~20)mA/ 24V DC 2-wire
3	(4~20)mA/ 24V DC 4-wire
4	(4~20)mA/ 220V AC 4-wire
5	(4~20)mA/ 24V DC/ HART, 2-wire
6	(4~20)mA/ 24V DC/ HART, 4-wire
7	(4~20)mA/ 220V AC/ HART, 4-wire
8	RS485/ Modbus
Y	Special design
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>
L	Aluminum/ IP 67
G	Stainless steel 304/ IP 67
<b>Code</b>	<b>Cable entry</b>
M	M20x1.5
N	½" NPT
<b>Code</b>	<b>Programmer/ Display</b>
V	With
X	Without
<b>Code</b>	<b>For water level monitoring</b>
H	Water in lake, river channel, reservoir, open channel, tidal level


**TLR94**

Code	Approvals			
P	Standard type (Non-explosion)			
I	Intrinsically safe (Ex ia IIC T6 Ga )			
D	Intrinsically and explosion proof type (Ex d IIC T6 Gb)			
Code	Process connection/ Material			
GA	Thread G1½" A/ 304 SS			
GB	Thread G1½" A/ 316L SS			
NA	NPT thread 1½" / 304 SS			
NB	NPT thread 1½" / 316L SS			
Code	Flange matching/ Material			
Flange size	Material	304 SS	316L SS	304 SS
	Code	(Face flange)	(Face flange)	(Universal flange)
DN40 PN16 flange		AA	AB	—
DN50 PN16 flange		BA	BB	—
DN65 PN16 flange		CA	CB	—
DN80 PN16 flange		DA	DB	DW
DN100 PN16 flange		EA	EB	EW
DN125 PN16 flange		FA	FB	FW
DN150 PN16 flange		GA	GB	GW
DN200 PN16 flange		HA	HB	HW
DN250 PN16 flange		JA	JB	JW
ANSI 1.5" 150lb flange		AAM	ABM	—
ANSI 2" 150lb flange		BAM	BBM	—
ANSI 2.5" 150lb flange		CAM	CBM	—
ANSI 3" 150lb flange		DAM	DBM	DWM
ANSI 4" 150lb flange		EAM	EBM	EWM
ANSI 5" 150lb flange		FAM	FBM	FWM



ANSI 6" 150lb flange	GAM	GBM	GWM
ANSI 8" 150lb flange	HAM	HBM	HWM
ANSI 10" 150lb flange	JAM	JBM	JWM
X	None		
Y	Special design		
<b>Code</b>	<b>Air Purging</b>		
A	With		
B	Without		
<b>Code</b>	<b>Antenna type/ Material</b>		
HA	Parabolic antenna $\Phi$ 196mm/ stainless steel 304		
JA	Parabolic antenna $\Phi$ 242mm/ stainless steel 304		
<b>Code</b>	<b>Radiation fins/ Process temperature</b>		
P	Without/ (-60 ~ +150) $^{\circ}$ C		
G	With/ (-60 ~ +250) $^{\circ}$ C		
<b>Code</b>	<b>Electronic unit</b>		
2	(4~20)mA/ 24V DC 2-wire		
3	(4~20)mA/ 24V DC 4-wire		
4	(4~20)mA/ 220V AC 4-wire		
5	(4~20)mA/ 24V DC/ HART, 2-wire		
6	(4~20)mA/ 24V DC/ HART, 4-wire		
7	(4~20)mA/ 220V AC/ HART, 4-wire		
8	RS485/ Modbus		
Y	Special design		
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>		
L	Aluminum/ IP 67		
G	Stainless steel 304/ IP 67		
<b>Code</b>	<b>Cable entry</b>		
M	M20x1.5		
N	1/2" NPT		
<b>Code</b>	<b>Programmer/ Display</b>		
V	With		
X	Without		

**TLR95**


<b>Code</b>	<b>Approvals</b>			
P	Standard type (Non-explosion)			
I	Intrinsically safe (Ex ia IIC T6 Ga )			
D	Intrinsically and explosion proof type (Ex d IIC T6 Gb)			
E	Certificate for shipbuilding (CCS)			
<b>Code</b>	<b>Process connection/ Material</b>			
GA	Thread G1½" A/ 304 stainless steel			
GB	Thread G1½" A/ 316L stainless steel			
NA	NPT thread 1½" / 304 stainless steel			
NB	NPT thread 1½" / 316L stainless steel			
<b>Code</b>	<b>Flange matching/ Material</b>			
<b>Flange size</b>	<b>Material Code</b>	<b>304 SS (Face flange)</b>	<b>316L SS (Face flange)</b>	<b>316L SS (Universal flange)</b>
DN40 PN16 flange		AA	AB	—
DN50 PN16 flange		BA	BB	—
DN65 PN16 flange		CA	CB	—
DN80 PN16 flange		DA	DB	DW
DN100 PN16 flange		EA	EB	EW
DN125 PN16 flange		FA	FB	FW
DN150 PN16 flange		GA	GB	GW
DN200 PN16 flange		HA	HB	HW
DN250 PN16 flange		JA	JB	JW
ANSI 1.5" 150lb flange		AAM	ABM	—
ANSI 2" 150lb flange		BAM	BBM	—
ANSI 2.5" 150lb flange		CAM	CBM	—
ANSI 3" 150lb flange		DAM	DBM	DWM
ANSI 4" 150lb flange		EAM	EBM	EWM



ANSI 5" 150lb flange	FAM	FBM	FWM
ANSI 6" 150lb flange	GAM	GBM	GWM
ANSI 8" 150lb flange	HAM	HBM	HWM
ANSI 10" 150lb flange	JAM	JBM	JWM
X None			
Y Special design			
<b>Code</b>	<b>Air purging</b>		
A	With		
B	Without		
<b>Code</b>	<b>Antenna type/ Material</b>		
	<b>Material</b>	304 SS	316L SS
<b>Size</b>	<b>Code</b>		
Horn antenna $\Phi$ 36mm		AA	AB
Horn antenna $\Phi$ 46mm		BA	BB
Horn antenna $\Phi$ 62mm		CA	CB
Horn antenna $\Phi$ 76mm		DA	DB
Horn antenna $\Phi$ 96mm		EA	EB
Horn antenna $\Phi$ 121mm		FA	FB
Y	Special design		
<b>Code</b>	<b>Anticorrosive function</b>		
A	With		
B	Without		
<b>Code</b>	<b>Dustproof function</b>		
A	With		
B	Without		
<b>Code</b>	<b>High temperature adaptor/ Process temperature</b>		

P	Without/ (- 60 ~ +150)°C
G	With/ (- 60 ~ +250)°C
<b>Code</b>	<b>Electronic unit</b>
2	(4~20)mA/ 24V, DC, 2-wire
3	(4~20)mA/ 24V, DC, 4-wire
4	(4~20)mA/ 220V, AC, 4-wire
5	(4~20)mA/ 24V DC/ HART, 2-wire
6	(4~20)mA/ 24V DC/ HART, 4-wire
7	(4~20)mA/ 220V AC/ HART, 4-wire
8	RS485/ Modbus
Y	Special design
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>
L	Aluminum/ IP 67
G	Stainless steel 304/ IP 67
<b>Code</b>	<b>Cable entry</b>
M	M20x1.5
N	½" NPT
<b>Code</b>	<b>Programmer/ Display</b>
V	With
X	Without
<b>Code</b>	<b>For Strongly Corrosive Liquids</b>
F	Sealed antenna with anti-corrosion cover
FF	Whole sealed instrument
	Note: for antenna size of 96mm or 62mm (specially designed)

**TLR96**

<b>Code</b>	<b>Approvals</b>	
P	Standard type (Non-explosion)	
I	Intrinsically safe (Ex ia IIC T6 Ga )	
D	Intrinsically and explosion proof type (Ex d IIC T6 Gb)	
<b>Code</b>	<b>Flange matching/ Material</b>	

Flange size	Material	304 SS	316L SS
	Code	(Plane complex flange)	(Plane complex flange)
DN50 PN16 flange		BA	BB
DN65 PN16 flange		CA	CB
DN80 PN16 flange		DA	DB
DN100 PN16 flange		EA	EB
DN125 PN16 flange		FA	FB
DN150 PN16 flange		GA	GB
DN200 PN16 flange		HA	HB
DN250 PN16 flange		JA	JB
ANSI 2" 150lb flange		BAM	BBM
ANSI 2.5" 150lb flange		CAM	CBM
ANSI 3" 150lb flange		DAM	DBM
ANSI 4" 150lb flange		EAM	EBM
ANSI 5" 150lb flange		FAM	FBM
ANSI 6" 150lb flange		GAM	GBM
ANSI 8" 150lb flange		HAM	HBM

ANSI 10" 150lb flange	JAM	JBM
Y Special design		
<b>Code</b>	<b>Radiation fins/ Process temperature</b>	
P	Without/ ( - 60 ~ +150)°C	
<b>Code</b>	<b>Electronic unit</b>	
2	(4~20)mA/ 24V DC, 2-wire	
3	(4~20)mA/ 24V DC , 4-wire	
4	(4~20)mA/ 220V AC , 4-wire	
5	(4~20)mA/ 24V DC/ HART, 2-wire	
6	(4~20)mA/ 24V DC/ HART, 4-wire	
7	(4~20)mA/ 220V AC/ HART, 4-wire	
8	RS485/ Modbus	
Y	Special design	
<b>Code</b>	<b>Housing/ Enclosure protection grade</b>	
L	Aluminum/ IP 67	
G	Stainless steel 304/ IP 67	
<b>Code</b>	<b>Cable entry</b>	
M	M20x1.5	
N	½" NPT	
<b>Code</b>	<b>Programmer/ Display</b>	
V	With	
X	Without	

## 10. Model selection data sheet

### Customer information

Company:

Contact person:

Address:

Post code:

Telephone:

Fax:

Mobile phone:

E-mail:

Date:

### Certificate

- Standard type (non-explosion proof)     Intrinsically type (Ex ib IIB T5)
- Intrinsically type (Ex ib IIC T6 Gb)
- Intrinsically type +marine approval (Ex ib IIC T6 Gb)
- Intrinsically + explosion proof type (Ex d ib IIC T6 Gb)

### Tank/container information:

Tank type:

Storage tank

Reaction tank

Separation tank

Marine tank

### Tank structure:

Tank material :

Tank pressure :

### Tank size:

Height of tank:            m

Diameter of tank:            m

### Top of a tank:

Arch

Flat top

Open

Conic top

**Bottom of a tank:**

- Tapered       Flat       Inclined       Arc

**Installation position:**

- Top       Side       Bypass pipe       Wave guide pipe

Extension pipe (important information):

Extension pipe height (Length):                      mm,

Extension pipe diameter:                                      mm

**Measuring medium:**

Medium name:                       Liquid       Solid       Mixed

Medium temperature:      °C                      Dielectric constant:

Adhesive:       Yes       No      Stirring:       Yes       No

**Process connection:**

Thread:       G1½"       1½" NPT

Flange (DN=      )                       Flange (ANSI=      )

**Power supply:**

24V DC 2-wire       24V DC 4-wire       220V AC       6V DC       12V DC

**Output:**

4-20mA                       Hart                       RS485/Modbus

**Display:**

With display and programmer       Without display and programmer